United States
Department of
Agriculture

Service Center
Modernization Initiative
(SCMI)

STANDARD

Geospatial Symbology

DRAFT

June 24, 2004

Prepared by:
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Introduction

As directed by the Secretary of Agriculture's March 16, 1998 memorandum, the Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA), and Rural Development (RD) agencies are co-locating offices, modernizing business processes, and partnering to achieve a "one-stop service" for United States Department of Agriculture (USDA) customers at their county-based field offices (Service Centers). One of the major components of the modernization initiative involves the implementation of a Geographic Information System (GIS) across each of the Partner Agencies and in all 2,550 Service Center offices. A Service Center Data Team has been chartered with the overall responsibility for implementing an infrastructure for management of data resources for the Partner Agencies. The GIS Standards Team 5 was formed to address specific data management issues regarding geospatial data.

The individuals who contributed to the development of this standard are:

David Anderson, (NRCS) Service Center Data Team Leader

Shandy Bittle (NRCS)	Kathy Green (NRCS)	Randy Frosh (Synergetics)
Anne Taylor (ESRI)	Nathan McCaleb (NRCS)	Michael Schramm (NRCS)

Figure 1 — Working group list

RECORD OF CHANGE

Revision/Change Number	Update Number	Date of Change	Description/Reason for Change	Pages/Sections Affected
1	1			

Table of Contents

Table of Figures and Tables

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STANDARD FOR GEOSPATIAL SYMBOLOGY

1. Overview

The objectives of this standard are to help in managing United States Department of Agriculture (USDA) Service Center Modernization Initiative (SCMI) geospatial data by establishing conventions and standards for map symbology; support the concurrent USDA Service Center Modernization Strategy to develop a basic nationally consistent set of core geospatial data that will provide a foundation on which to base business applications; and to relate to other SCMI geospatial standards including SCMI Std 003, *Standard for Geospatial Data Set Metadata* [A2][1], SCMI Std 005, *Standard for Geospatial Feature Metadata* [A3], SCMI Std 007, *Standard for Geospatial Data* [A4], SCMI Std 004, *Standard for Geospatial Dataset File Naming* [A5], and the *USDA Service Center Initiative Directory Structure and File Naming Convention Change Control Policy* [A6].

Appendix A of this standard provides bibliography references to the documents listed above.

1.1. Scope

The scope of this standard is to define the cartographic feature symbology and conventions for the *geospatial dataset collection* (physical repository of data) that resides at a USDA Service Center. This standard shall apply to the set of nationally consistent core geospatial data layers first defined in the *USDA Service Center Geographic Information System (GIS) Strategy* [A7]. It also provides guidance on the cartographic feature symbology and conventions for locally acquired and derived geospatial data.

1.2. Purpose

GIS for the Service Center is expected to comprise nationwide coverage of more than 20 common *geospatial datasets* (a group of similar spatial phenomena) that are collected and distributed at the county level of geography.

The purpose of this standard is to document the cartographic feature symbolization that shall be used for all *geospatial datasets* (a group of similar spatial phenomena) in use under the USDA Service Center Initiative (SCI). This standard serves as a reference tool for persons responsible for cartographic production. Adherence to this standard is necessary to ensure that maps of all geospatial data sets within the SCI are, at a minimum, produced with consistent cartographic symbolization.

This consistent documentation is necessary for users within and outside of the SCI. In addition, nationally fielded applications will be developed that rely on the nationally consistent set of symbolization. Applications that are built locally for a USDA Service Center or for data that is acquired locally shall also adhere to these standards.

[1] The number in brackets corresponds to those of the bibliography in Appendix A.

1.3. Acronyms and abbreviations

CAD	Computer Aided Drafting
DOD	Department Of Defense
ERMS	Emergency Response Map Symbology
FGDC	Federal Geographic Data Committee
FSA	Farm Service Agency
GIS	Geographic Information System
NRCS	Natural Resources Conservation Service
OGC	Open GIS Consortium
RD	Rural Development
SCMI	Service Center Modernization Initiative
SLD	Styled Layer Descriptor
SMS	Style Management Service
SSURGO	Soil Survey Geographic Database
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VPF	Vector Product Format

2. Background

2.1. NRCS-SOI-37A

A document known as NRCS-SOI-37A has been widely used for many years to develop soil survey maps. It is the official document used expressly for the soil survey initiative where soil map symbols are concerned.

The document, primarily referred to as the '37A', provides the most current listing of map features used in the publication of soil survey maps. This standard references 37A but does not replace it. 37A is the authoritative source for soils symbology.

Included on 37A are the area, line and point features that comprise the three data layers recognized in soil survey: SSURGO, Hydrography and Culture. Of the three data themes, SSURGO is a compulsory component; Hydrography and Culture are considered optional. These layers are further described below:

- SSURGO consists of area, line and point soil delineations and their associated labels, line and point "standard landform and miscellaneous surface features" and line and point ad hoc features.

- Cultural features consist of administrative/political boundaries, public land survey, roads and road emblems and point feature 'located objects', e.g. cemeteries, churches, schools and windmills.

- Hydrographic features consist of line features for streams and drainage ditches. These are perennial, intermittent or unclassified, and flood pool lines. Point features consist of springs, wells and drainage ends.

The National Soil Survey Handbook, part 627 references the 37A and prescribes that each soil survey area requires a Feature and Symbol Legend for the Soil Survey. The legend identifies all approved map features that may be published in soil surveys including:

- Area, line, and point soil features including soil boundary lines and soil symbols.
- Ad hoc features and standard landform and miscellaneous surface features that are too small to be delineated as areas on soil map sheets at either 1:12,000 (<1.4 acres) or 1:24,000 (<5.7 acres) scale.
- Cultural features, such as structures, political boundaries, road emblems, and airports
- Hydrographic features, such as streams, springs, and wells.

The National Soil Survey Handbook, part 627 further prescribes that:

1. Each soil survey area requires a Feature and Symbol Legend for Soil Survey (NRCS-SOI-37A 5/01).
2. Standard landform and miscellaneous surface features or ad hoc features be used to show local areas of significantly contrasting soils or features too small to delineate at the publication scale. The need for these features depends on their significance to the present or projected use of the soils and the soil map. These features are primarily for location purposes and only surface determined properties or responses define them. These features are not used to indicate soils or features that are identified in the name or description of the map unit delineated. Nor are these features used as identifying symbols in small delineations.
3. Ad hoc features on the 37A are defined in the section entitled Descriptions for Ad Hoc Features. Define the specific kind and size of the area represented.
4. All symbols must correspond exactly to those listed on form NRCS-SOI-37A
5. The soil survey project office prepares the first draft of the feature and symbol legend before the initial field review of the survey area using the NRCS-SOI-37A. The review report includes the NRCS-SOI-37A.

2.2. USGS Topographic Symbols

The standard symbology found on USGS topographic sheets is recognized, well know and has been in use as a standard for many years. The symbology pages are found on: http://mac.usgs.gov/mac/isb/pubs/booklets/symbols/

Appendix B also provides the USGS symbolization for easy reference by the reader.

2.3. OGC Initiatives

The Open GIS Consortium (OGC) is sponsoring The Emergency Mapping Symbology Interoperability Program Initiative that will be a test bed initiative focusing on maturing the Style Management Service (SMS) and the Styled Layer Descriptor (SLD) with application to Emergency Mapping Symbology. The project will test enabling the use of multiple symbol sets with one set of feature data. The symbology used will likely come from the following:

- Emergency Response Map Symbology (ERMS) – a map symbology set being defined by the FGDC Homeland Security Work Group. See: http://www.fgdc.gov/publications/homeland.html

- Geospatial Symbols (GeoSym) for Digital Displays. The map symbology set defined by Department of Defense (DOD) to portray Vector Product Format (VPF) data. Reference TBD.

This request for quotation is intended to address requirements including the development of a client for publishing, managing, and previewing particular symbolization configurations, testing the assignment of symbols to particular feature types from a feature level data store, testing and enhancement of the Style Layer Descriptor Implementation Specification and its use in Web Mapping Service implementations to support the portrayal specified symbol sets, and testing and enhancing the Style Management Services Specification.

2.4. National Conservation Planning Map Symbols Standard

There is a standard for conservation planning symbols. The document is entitled National Map Symbols Handbook, Title 170, Part 601 [A8]. However, it is last dated October 1990 and contains map symbols designed primarily for use for the then named "Soil Conservation Service". It was intended to closely resemble the map symbols in common usage by various U.S. Government agencies. This document is for reference use only, because many of the symbols have been superseded by those currently used by the Natural Resources Conservation Service. The document further contains all of the symbols that were contained in the NRCS-SOI-37A in existence then, many of which have either been discarded or modified to their current forms. Also note that the 1993 NPPH Exhibit 12 includes planning symbols.

As a result of the above, the document is for reference use only. When and if the document is reprinted, it will refer to this document.

2.5. National CAD Standards

The National CAD Standards Development Team has interest in using information found in the draft NRCS National Digital Geospatial Map Symbols Handbook, Title 170, Part 601.

The scales of CAD work are most often much different than the scales of the items covered in that handbook. However, if would be useful if there was a section in the National Map Symbols Handbook for: "Construction Drawings". Then all symbols would be in one reference.

Contact Norman J. Friedrich [mailto:norman.friedrich@ia.usda.gov]
OR

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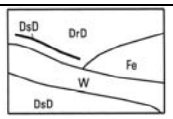
(817) 509-3767

At this time, it has been decided that CAD symbology will not be included in this geospatial symbology document because of the difference in scale of the graphics.

3. NRCS-SOI-37A

This is the current version of NRCS-SOI-37A as of March 29,2004 and is included here for easy reference by the reader. The ad hoc symbols are defined and likely to be unique for each soil survey area.

SOIL SURVEY FEATURES

SOIL DELINEATIONS AND LABELS	

STANDARD LANDFORM AND MISCELLANEOUS SURFACE FEATURES

Bedrock escarpment	
Non-bedrock escarpment	
Gully	
Levee	
Short steep slope	
Blowout	
Borrow pit	
Clay spot	
Closed depression	
Gravel pit	
Gravely spot	
Landfill	
Lava flow	
Marsh or swamp	
Mine or quarry	
Miscellaneous water	
Perennial water	
Rock outcrop	
Saline spot	
Sandy spot	
Severely eroded spot	
Sinkhole	
Slide or slip	
Sodic spot	
Spoil area	
Stony spot	
Vary stony spot	
Wet spot	

AD HOC FEATURES

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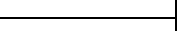
CULTURAL FEATURES
(Optional)

National, state or providence	
County or parish	
County or parish	
Reservation (national or state forest or park)	

Limit of soil survey (label) and/or denied access area	
Field sheet matchline and neatline	
Public Land Survey System Section Boundary	
Public Land Survey System Section Corner Tics.	

TRANSPORTATION

Divided road Normally not shown	
Other road Normally not shown	
Trail Normally not shown	

ROAD EMBLEMS

Interstate	
Federal	
State	
County, farm or ranch	

LOCATED OBJECTS

Airport, airfield	
Cemetery	
Church	
Farmstead, house (omit in urban areas)	
Lighthouse	
Located object (Label)	Ranger Station
Lookout tower	
Oil and/or natural gas well	
Other Religion (label)	Mt. Carmel
School	
Soil sample site (compiled only not published)	
Tank (label)	Petroleum
Windmill	

HYDROGRAPHIC FEATURES
(Optional)

Drainage end (indicates direction of flow)	
Perennial stream	
Intermittent stream	
Unclassified stream	
Perennial drainage or irrigation ditch	
Intermittent drainage or irrigation ditch	
Unclassified drainage or irrigation ditch	
Flood pool line	
Spring	
Well, artesian	
Well, irrigation	

Figure 3.1 — NRCS-SOI-37A

4. Style Sheets

This Cartographic Symbology Standard is based on NRCS-SOI-37A. However, the 37A does not provide guidance on symbolization for conservation plan maps, maps produced by the partner agencies-Farm Service Agency (FSA) and Rural Development (RD) or ad hoc maps.

As a result, this standard was developed and this section provides style sheets for all map symbols including those found on the 37A.

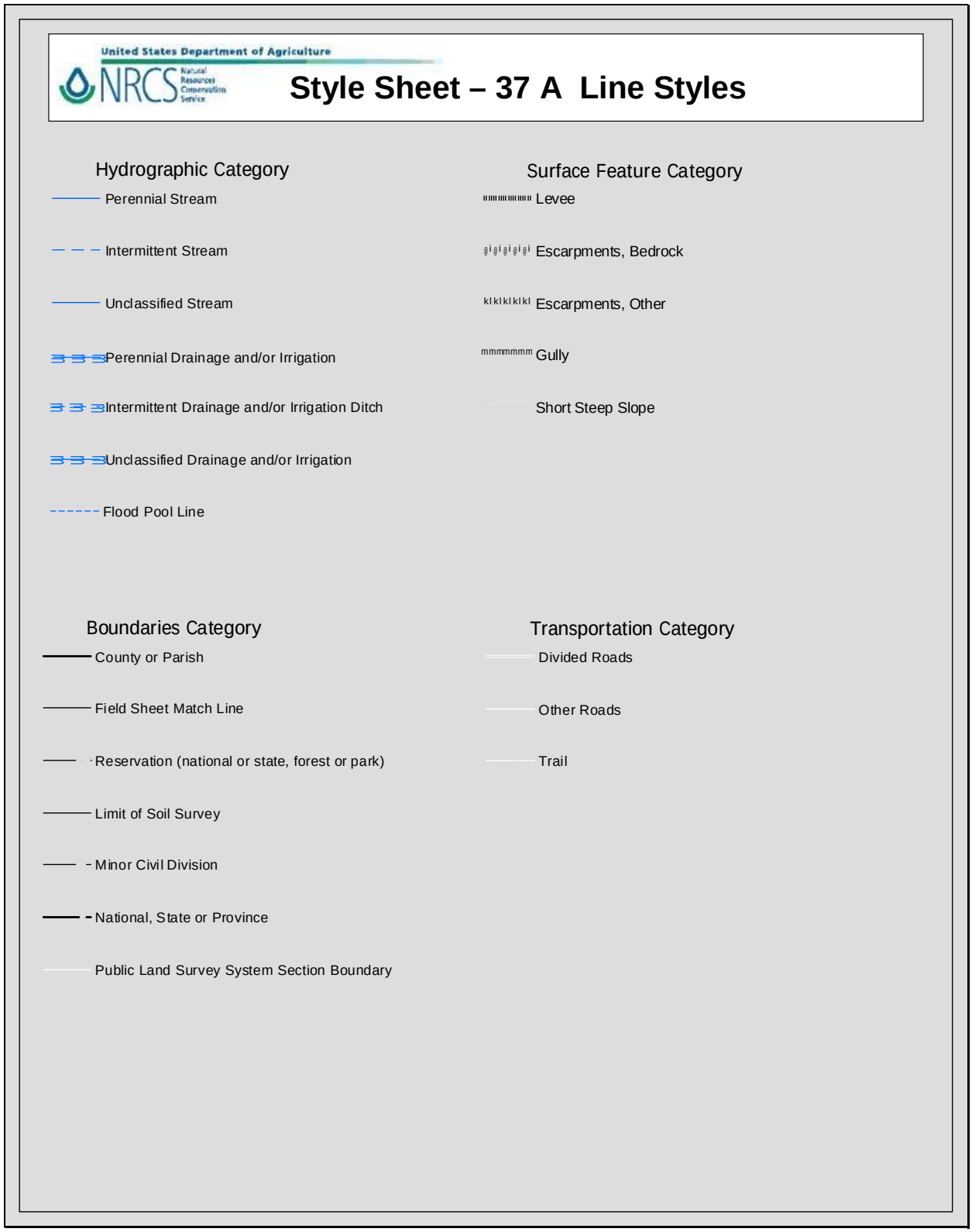
As of 9-APR-04 these NRCS style sheets are not on a USDA site but are on the ESRI website at: http://arcscripts.esri.com/details.asp?dbid=12520

The True Type fonts are first loaded after which they can be used within the ArcMap Symbology Editor to create marker symbols, line symbology, etc.

Creating new marker symbols, line styles & fill styles in ArcMap is done with the Symbology Property Editor. This is accessed from the ArcMap Style Manager (Tools->Styles->Style Manager). This provides access to any fonts on your system to create new symbology.

To produce the following proof sheets, the Style Dump utility in ArcMap is used. Information on using the Style Dump utility is found at:
http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=21180
That output is then put into PowerPoint and finally exported to Word.

4.1. 37A Line Styles



4.2. 37A Marker Styles

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Style Sheet – 37 A Marker Styles

Located Objects Category

± Cemetary
V Church
; Airport, Airfield
K House, Farmstead
T Lighthouse
6 Located Object
Q Lookout Tower
R Oil and/or Natural Gas Well
N Other Religion
M School
J Soil Sample Site
P Tank
S Windmill

Surface Feature Category

' Blowout
Borrow Pit
(Clay Spot
! Closed Depression
$ Gravel Pit
) Gravelly Spot
& Landfill
* Lava Flow
[Marsh or Swamp
% Mine or Quarry
7 Miscellaneous Water
6 Perennial Water
, Rock Outcrop
- Saline Spot
. Sandy Spot
/ Severely Eroded Spot
" Sinkhole
0 Slide or Slip
1 Sodic Spot
2 Spoil Area
3 Stoney Spot
4 Very Stoney Spot
5 Wet Spot

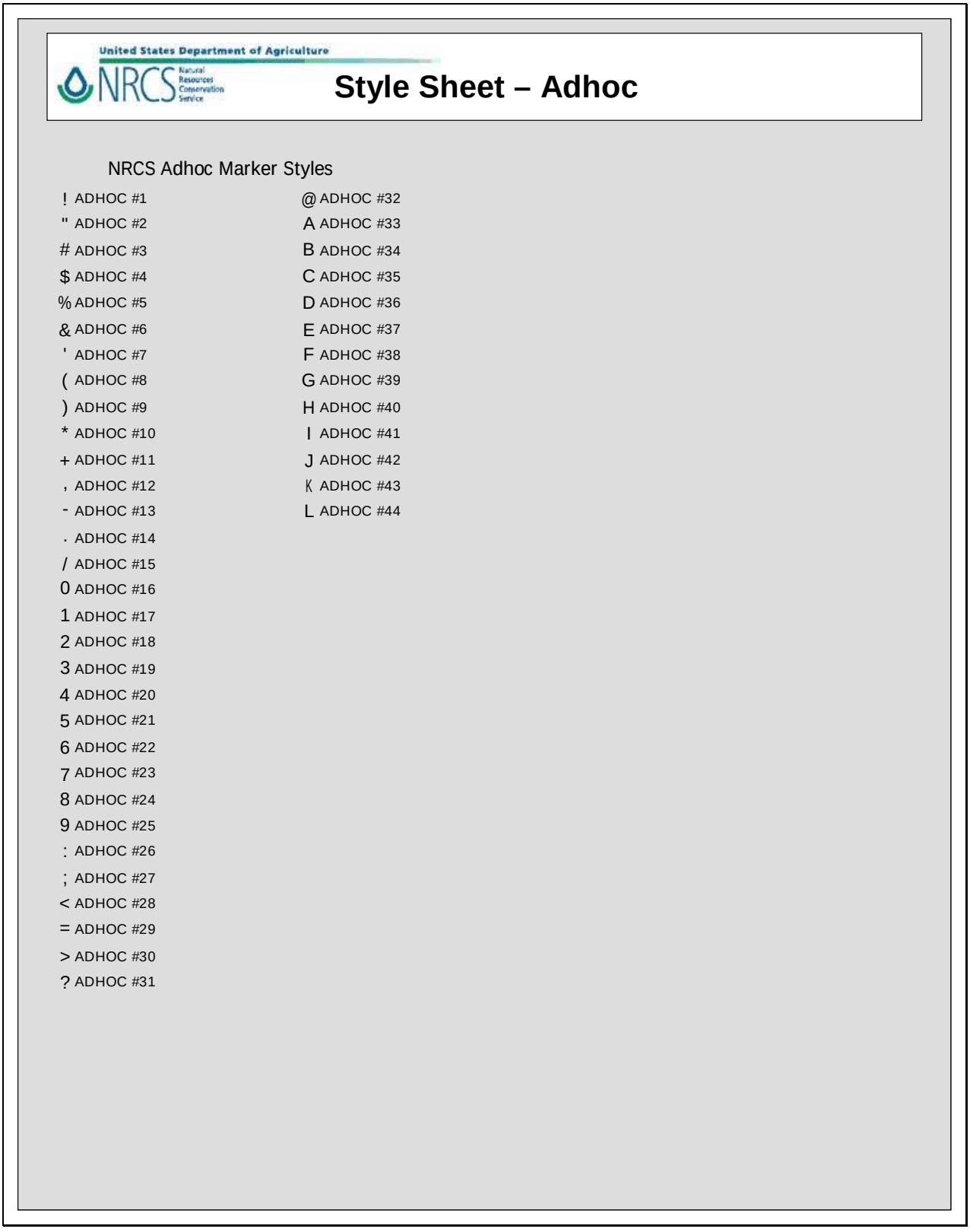
Boundaries Category

A Public Land Survey System Section Corner Tic
@ Public Land Survey System Section Corner Tic
e Public Land Survey System Section Corner Tic

Hydrographic Category

? Spring
; Well, Artesian
< Well, Irrigation
= Drainage End

4.3. Ad Hoc Marker Styles



4.4. SSURGO Marker Styles

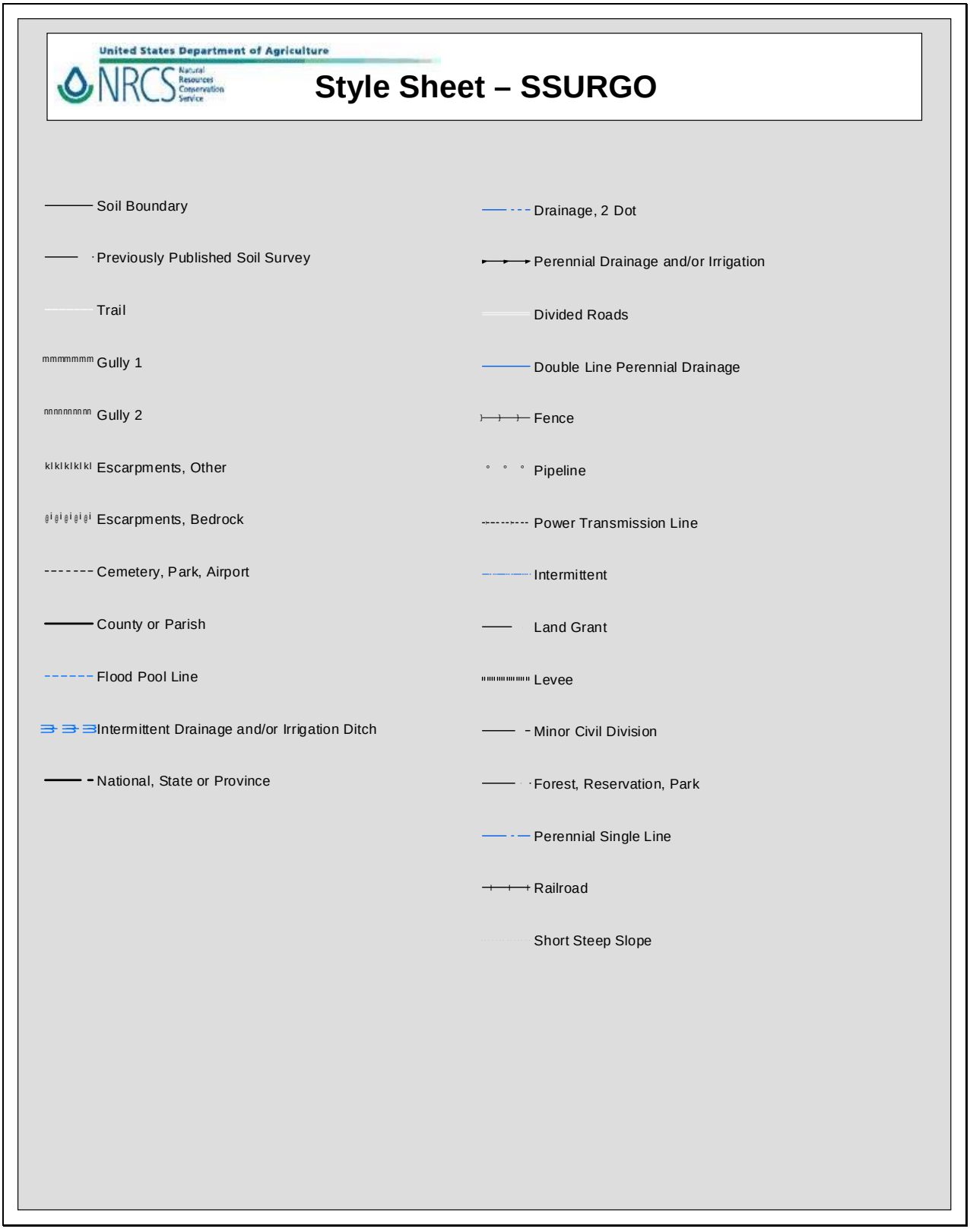
United States Department of Agriculture
NRCS Natural Resources Conservation Service

Style Sheet – SSURGO

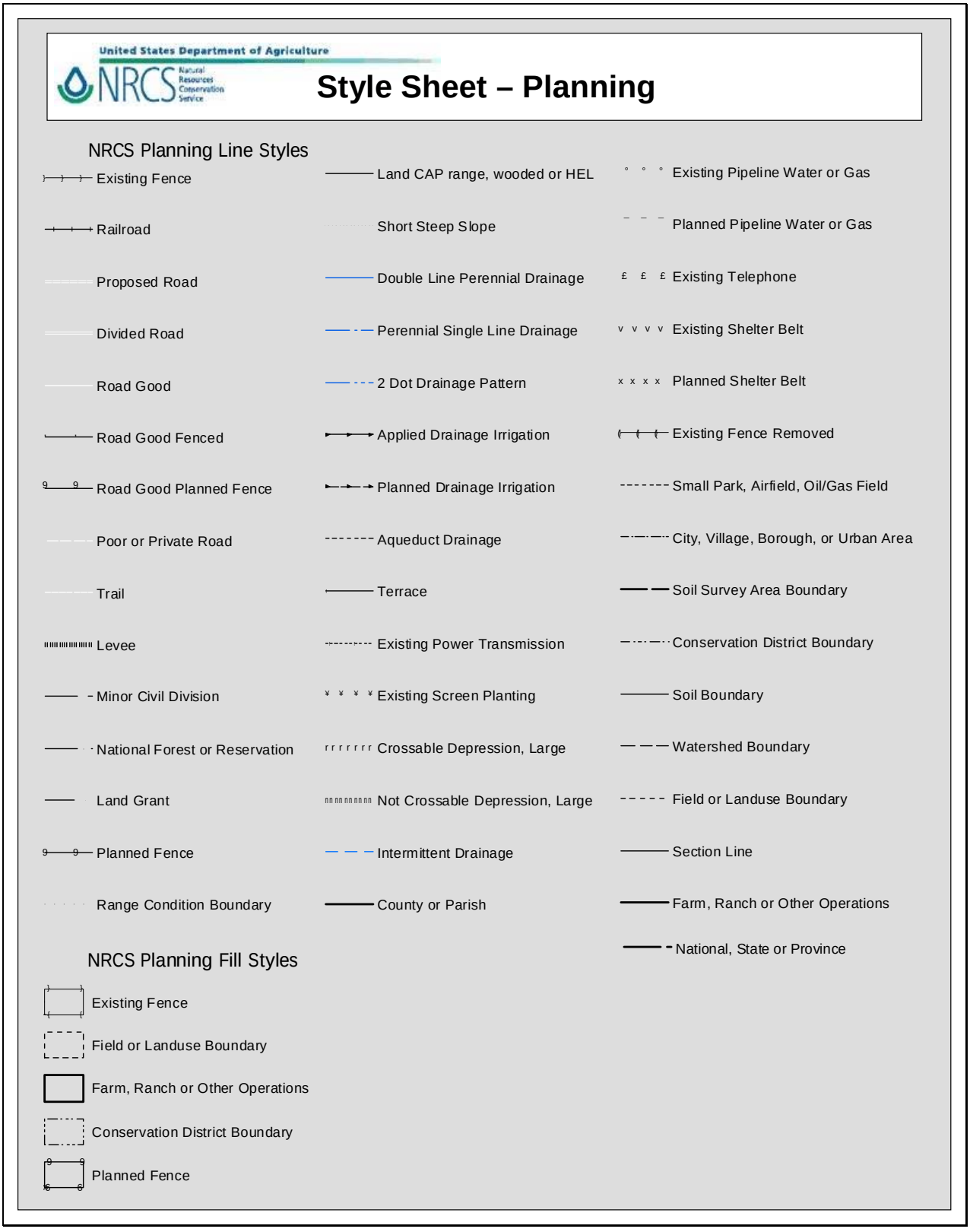
NRCS SSURGO Marker Styles

! Depression	B Interstate
" Sinkhole	C Interstate Expanded
# Borrow Pit	D Federal
$ Gravel Pit	E Federal Expanded
% Mine or Quarry	F State
& Landfill	G State Expanded
' Blowout	H County, Farm, Ranch
(Clay Spot	I Prominent Hill or Peak
) Gravelly Spot	J Soil Sample Site
* Lava Flow	K House, Farmstead
+ Marsh or Swamp	L Church
, Rock Outcrop	M School
- Saline Spot	N Other Religious
. Sandy Spot	O Located Object
/ Severely Eroded Spot	P Tank
0 Slide or Slip	Q Lookout Tower
1 Sodic Spot	R Oil/Gas Well
2 Spoil Area	S Windmill
3 Stoney Spot	T Lighthouse
4 Very Stoney Spot	V Drainage End
5 Wet Spot	d Land Division Corner
6 Perennial Water	c Land Division Corner (NE)
7 Miscellaneous Water	b Land Division Corner (SE)
8 Spring	a Land Division Corner (NW)
9 Artesian Well	e Land Division Corner (SW)
: Irrigation Well	
; Airport, Airfield	
< Cemetery	
= Small Cemetery	
? Land Division Corner	
A Geographic Coordinate Tick	

4.5. SSURGO Line Styles



4.6. Planning Line and Fill Styles



4.7. Planning Marker Styles

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Style Sheet – Planning

NRCS Planning Marker Styles

! Existing Pipe Riser	@ Drainage End
" Planned Pipe Riser	A Storage Tanks
# Existing Pump	B Existing Flood Gate
$ Planned Pump	C Planned Flood Gate
% Existing Trough	D Existing Well
& Planned Trough	E Planned Well
' Existing Windmill & Trough	F Depression
(Planned Windmill & Trough	G Depression Not Crossable
) Existing Windmill	H Depression Crossable
* Planned Windmill	I Depression Contains Water
+ Existing Water Tank	J Mine Shaft
, Planned Water Tank	K Gravel Pit
- Planned Spring Devel	L Quarry Mine
. Existing Spring Devel	M Mine Tunnel Opening
/ Existing Division Box	N Prospect Mine
0 Planned Division Box	O Borrow Pit
1 Existing Diversion	P Existing Salt Ground
2 Planned Diversion	Q Planned Salt Ground
3 Planned Check Dam	R Bridge Tunnel (left)
4 Existing Check Dam	S Bridge Tunnel (right)
5 Existing Drop Structure	T Airport
6 Planned Drop Structure	U Airway Beacon
7 Existing Pit	V Church
8 Planned Pit	W Cemetary, Small
9 Existing Spring & Trough	X Cemetary, Large
: Planned Spring & Trough	Y Cemetary, Small (2)
; Well, Artesian	Z School
< Well, Irrigation	[Sawmill
= Wet Spot	\ Stack Yard
> Marsh Swamp	] House Farmstead
? Spring	^ Buildings

Appendix A – Bibliography

When the following standards are superseded by an approved revision, the revision shall apply.

[A1] Geospatial Data Acquisition, Integration, and Delivery National Implementation Strategy Plan, Draft #4 Service Center Business Process Reengineering Data AID Team, September 22, 1999

[A2] SCMI Std 003, Standard for Geospatial Data Set Metadata

[A3] SCMI Std 005, Standard for Geospatial Feature Metadata

[A4] SCMI Std 007, Standard for Geospatial Data

[A5] SCMI Std 004 Standard for Geospatial Dataset File Naming

[A6] USDA Service Center Initiative Directory Structure and File Naming Convention Change Control Policy

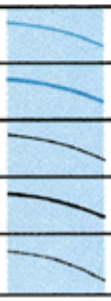
[A7] USDA Service Center Geographic Information System (GIS) Strategy

[A8] NRCS National Map Symbol Handbook, Title 170, Part 601

Appendix B – USGS Topographic Map Symbols

Elevation

CONTOURS

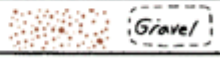
Topographic	
Intermediate	
Index	
Supplementary	
Depression	
Cut; fill	
Bathymetric	
Intermediate	
Index	
Primary	
Index Primary	
Supplementary	

Boundaries

BOUNDARIES	
National	
State or territorial	
County or equivalent	
Civil township or equivalent	
Incorporated city or equivalent	
Park, reservation, or monument	
Small park	

Land Surface Features

SURFACE FEATURES

Levee	
Sand or mud area, dunes, or shifting sand	
Intricate surface area	
Gravel beach or glacial moraine	
Tailings pond	

MINES AND CAVES

Quarry or open pit mine	
Gravel, sand, clay, or borrow pit	
Mine tunnel or cave entrance	
Prospect; mine shaft	
Mine dump	
Tailings	

VEGETATION

Woods	
Scrub	
Orchard	
Vineyard	
Mangrove	

GLACIERS AND PERMANENT SNOWFIELDS

Contours and limits	
Form lines	

Water Features

MARINE SHORELINE

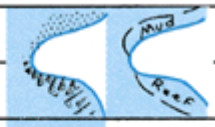
Topographic maps

Approximate mean high water	
Indefinite or unsurveyed	

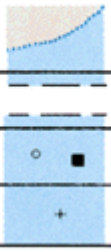
Topographic-bathymetric maps

Mean high water	
Apparent (edge of vegetation)	

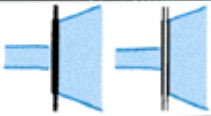
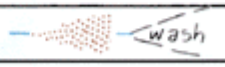
COASTAL FEATURES

Foreshore flat	
Rock or coral reef	
Rock bare or awash	
Group of rocks bare or awash	
Exposed wreck	
Depth curve; sounding	
Breakwater, pier, jetty, or wharf	
Seawall	

BATHYMETRIC FEATURES

Area exposed at mean low tide; sounding datum	
Channel	
Offshore oil or gas: well; platform	
Sunken rock	

RIVERS, LAKES, AND CANALS

Intermittent stream	
Intermittent river	
Disappearing stream	
Perennial stream	
Perennial river	
Small falls; small rapids	
Large falls; large rapids	
Masonry dam	
Dam with lock	
Dam carrying road	
Perennial lake; Intermittent lake or pond	
Dry lake	
Narrow wash	
Wide wash	
Canal, flume, or aqueduct with lock	
Elevated aqueduct, flume, or conduit	
Aqueduct tunnel	
Well or spring; spring or seep	

SUBMERGED AREAS AND BOGS

Marsh or swamp	
Submerged marsh or swamp	
Wooded marsh or swamp	
Submerged wooded marsh or swamp	
Rice field	
Land subject to inundation	

Buildings and Related Features

BUILDINGS AND RELATED FEATURES	
Building	
School; church	
Built-up Area	
Racetrack	
Airport	
Landing strip	
Well (other than water); windmill	
Tanks	
Covered reservoir	
Gaging station	
Landmark object (feature as labeled)	
Campground; picnic area	
Cemetery: small; large	

Roads, Railroads, and Other Features

ROADS AND RELATED FEATURES

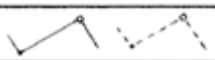
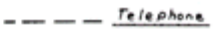
Roads on Provisional edition maps are not classified as primary, secondary, or light duty. They are all symbolized as light duty roads.

Primary highway	
Secondary highway	
Light duty road	
Unimproved road	
Trail	
Dual highway	
Dual highway with median strip	
Road under construction	U. C.
Underpass; overpass	
Bridge	
Drawbridge	
Tunnel	

RAILROADS AND RELATED FEATURES

Standard gauge single track; station	
Standard gauge multiple track	
Abandoned	
Under construction	
Narrow gauge single track	
Narrow gauge multiple track	
Railroad in street	
Juxtaposition	
Roundhouse and turntable	

TRANSMISSION LINES AND PIPELINES

Power transmission line: pole; tower	
Telephone line	
Aboveground oil or gas pipeline	
Underground oil or gas pipeline